Frequency Converter with Fan Cooling

The present invention relates to a frequency converter according to the preamble of Claim 1, in particular for devices used at construction sites.

At construction sites, as a rule the power supplied is line current having a frequency of 50 Hz and a voltage of 230 V (sometimes also 400 V). The frequency converter to which the present relates converts this power available at the site into, for example, a three-phase current having a frequency of 200 Hz and a protective extra-low voltage of 42 V, the protective extra-low voltage being required in order to protect the operator from electrical risk, e.g. in a wet environment.

In known devices of this type, an isolating transformer and a converter circuit board are used that, due to their power loss, release heat that has to be dissipated. This is achieved through the use of heat sinks having a sufficiently large cooling surface, a sufficiently large housing, or overdimensioning of the isolating transformer. These heat dissipation measures are cost-intensive and result in greater weight. The known devices can have external cooling fins that can accumulate dirt and concrete over time, which has an increasingly adverse effect on the heat dissipation.

From EP-A-0 854 565, a frequency converter is known that has a converter device surrounded by a housing for converting an electrical current frequency. The housing has a converter receptacle that surrounds a board chamber for the converter device, as well as a housing segment, connected to the converter receptacle, that acts as a cooling area, inside which there are situated cooling air ducts and a fan suited for conveying cooling air through the cooling air ducts.

The object of the present invention is to design an air-cooled frequency converter of the type indicated above in such a way that the constructively determined cooling efficiency is maintained even over a longer period of use, while also enabling a smaller, more compact construction so

that weight and manufacturing costs are reduced, and also such that, as a further cost-reducing measure, a predetermined basic construction can be used for devices of different power classes.

In order to achieve this object, according to the characterizing part of Claim 1 the present invention is characterized in that the housing has a converter receptacle that surrounds a board chamber for the converter device, and a housing segment that is connected to the converter receptacle and that acts as a cooling area in whose interior there are situated cooling air ducts and a fan that is suitable for conveying cooling air through the cooling air ducts, and in the cooling area the housing has an external first annular or extruded profile, in relation to whose axis additional annular extruded profiles are oriented to one another in such a way that they surround each other so as to form annular chambers at a distance from one another, transverse to the axial direction, and the annular or extruded profiles situated within the first extruded profile end with an axial spacing from the converter receptacle so as to form an air deflection.

The construction according to the present invention combines the housing and the cooling system to form a compact unit in which the active air cooling by the fan or ventilator enables the reduction of the required cooling surfaces, and in which external cooling fins, which are liable to dirtying and thus to reduction of cooling efficiency, can be omitted.

In an advantageous further development of the present invention, the cooling area has a transformer chamber, adjacent to the cooling air ducts, that accommodates an isolating transformer for producing an output voltage that differs from a line voltage. In this way, the isolating transformer and the converter device can be combined to form a unit as a frequency converter, the isolating transformer being situated in the cooling area itself for optimal cooling. The isolating transformer can be used to produce a protective extra-low voltage, e.g. 42 V. Of course, it is also possible to use the isolating transformer to produce an output voltage having a

higher value than the line voltage.

In a particularly advantageous construction, within the first extruded profile, and coaxial thereto, the fan is situated in the air deflection between the additional extruded profiles and the converter receptacle so as to be suitable for suctioning a cooling air stream via one of the annular chambers and expelling this stream via a different annular chamber according to the counterflow